

**TECHNICAL ASSISTANCE REQUEST
ASHTABULA CLOSURE PROJECT
ACP 03-02-3**

**FIELD EVALUATION OF A NaI-TIPPED GEOPROBE SYSTEM FOR SUBSURFACE
CHARACTERIZATION OF URANIUM**

SECTION 1 -- APPROVALS FOR TECHNICAL ASSISTANCE

_____ Contractor Site Representative	_____ OST/HQ Program Manager
_____ DOE Site Manager	_____ OST/HQ Office Director
_____ DOE OH Manager	

SECTION 2 -- BACKGROUND AND PROBLEM DESCRIPTION:

The ACP is currently evaluating various real-time surface scan technologies that may prove useful for cost-effectively delineating surficial uranium soil contamination. One limitation of these systems, however, is that they provide no information about the existence or extent of subsurface soil contamination. GeoProbe work combined with XRF analyses in the fall of 2001 did provide data sets to support the development of contaminated soil volume estimates for Area B. These data sets were insufficient, however, to actually delineate the extent of subsurface contamination encountered within Area B. In addition, there is evidence that there may be additional areas within Area B where subsurface contamination exists overlain by clean soils. The principal drawbacks of the current baseline (GeoProbe soil core extraction combined with ex situ soil core analyses via XRF or dig face characterization with FIDLER probes) are the costs involved and the turn-around time in obtaining results. The Ashtabula site has a need for a technology that can assist in better determining subsurface soil contamination extent, and in establishing that specific areas do not possess subsurface soil contamination concerns.

One option is an instrumented cone penetrometer probe developed by ARA. A probe suitable for deployment by GeoProbe was purchased by DOE-Ohio but has not been field tested. This probe uses a dedicated NaI sensor to provide gross gamma activity measurements near the probe tip while a GeoProbe push is underway. The advantages of this system are real-time results with no requirement that a soil core be retrieved for ex situ analysis. The principal question for this system in the context of Ashtabula is whether the system has sufficient sensitivity to identify the presence of elevated uranium in subsurface soils at the required action level of 30 pCi/g total uranium. A plan has been developed by Robert Johnson (ANL) for field testing of ARA probe for the detection of U at Ashtabula. The results of this test will be applicable to characterization activities scheduled at FCP this summer.

The Ashtabula site successfully deployed during Fall 2002 the Membrane Interface Probe (MIP) that was attached to the Geoprobe. The Geoprobe-MIP configuration used during this activity showed promise for rapid, cost effective, three-dimensional refinement of the source term in

areas with detectable VOC contamination. As a follow-on to this sampling effort, the NaI sensor is the next probe to be attached to the GeoProbe for subsurface characterization.

The purpose of this Technical Assistance (TA) request is to develop the information required to evaluate whether this system can be used for subsurface characterization of uranium. The results should assist in determining whether the NaI-tipped GeoProbe system has value for the Ashtabula site, and if so, what the expected operational characteristics are. The results will also be of value to other Ohio DOE sites. In particular, the FCP is interested in utilizing this type of system to characterize subsurface uranium and radium-226 contamination for selected portions of the site if the system can be demonstrated to meet performance requirements. The FCP's detection limits for total uranium are not as restrictive as at the Ashtabula site.

SECTION 3 -- SCOPE:

The scope of work for the TA Team is divided into several areas:

1. The first area is to determine background gross activity levels for the site and identify and quantify the principal sources of background variability as observed by the NaI system.
2. The second area is to collect information that can be used to complete the detection limit analysis, develop calibration equations for the system, and determine incremental gross activity triggers T_1 and T_2 that will be used when the system is delineating uranium contamination extent. The results from this work will determine whether the NaI has sufficient sensitivity to detect total uranium at 30 pCi/g reliably with a 30 second acquisition time (i.e., do samples with gross activity in the range of background+ L_d yield total uranium results less than 30 pCi/g?). The results should also provide the basis for estimating what the likely average incremental response (T_{30}) of the NaI would be to 30 pCi/g total uranium for a 30 second acquisition.
3. The third area is to determine operational factors that may affect the performance of the system for Ashtabula use. Examples include resolving data logging, management, and interpretation issues, matching measured data to appropriate depths, the ability of the probe to handle slant holes, likely production rates that might be achieved by the system, etc.

SECTION 4 -- SCHEDULING REQUIREMENTS:

Consistent with the site's soil remediation schedule and the sequence of work, it will be helpful if the requested TA can be accomplished in Spring 2003. Complying to this schedule will allow ACP to adhere to scheduled soil excavation activities beginning in late FY03 and early FY04.

SECTION 5 -- BENEFITS:

The primary benefits of this TA will be to determine the applicability of a NaI-tipped GeoProbe system for subsurface characterization of select radionuclides. It is expected that the TA effort will identify specifically:

- a. Whether the NaI-tipped GeoProbe system has value at the ACP for the qualifying and possibly quantifying subsurface uranium contamination

- b. Whether the NaI-tipped GeoProbe system could potentially be used at the Fernald site for subsurface characterization of Th, Ra and U that would support needed soil volume estimates for excavated soil that would go into their on-site disposal facility (OSDF).

The cost breakdown associated with typical gamma spectroscopy of soil sampling is as follows:

1.	Gamma Spectoscopy soil sample analysis	\$82 per sample
2.	GeoProbe Cost	\$1000 per day
3.	Field Crew (geologist & Technician	\$2,000 per day

These cost estimates assume that 20 soil samples can be collected per day using a GeoProbe resulting in analytical cost of \$1640 per day for either XRF or gamma spec analysis. The total estimated cost is ca. \$4640 per day for sampling and analyses.

The cost estimate for this TA is ca. \$50,000. This estimate includes technical support from one or more national laboratories, including ANL, EML, INEEL and ORNL, and from CPT personnel at SRS during a six to eight week period in spring.. Technical support will focus on deployment, calibration, operation and maintenance of the sensor system, as well as data evaluation and subsequent evaluation and reporting . The team will coordinate efforts with FCP personal for subsequent deployment of the technology to Fernald.

Cost savings or return on investment (ROI) is dependent on successful operation of the system either at the ACP or subsequently at the FCP. Detection limit requirements at FCP are significantly higher than at ACP, which increases the potential for a successful ROI at either site. Cost savings will initially result from savings in laboratory costs or an estimated \$1500 per day. Based on this estimate, it would take less than 35 days of operation to return the initial investment. Additional cost saving could result from an increased efficiency in field activities resulting in an increased number of Geoprobe borings. Two significant benefits resulting from successful application of realtime measurements would be (1) continuous measurements of a hole's profile as opposed to discrete sampling points and (2) a reduction in schedule resulting from realtime information during characterization and remediation.

SECTION 6 -- DELIVERABLES:

A summary of operation activities, success and failures, will be presented to DOE and Contractor management as a draft final status report at the conclusion of the field work. It is anticipated that after completion of the final report, the potential exist for further deployment of the system at the Fernald site to support their OSDF.